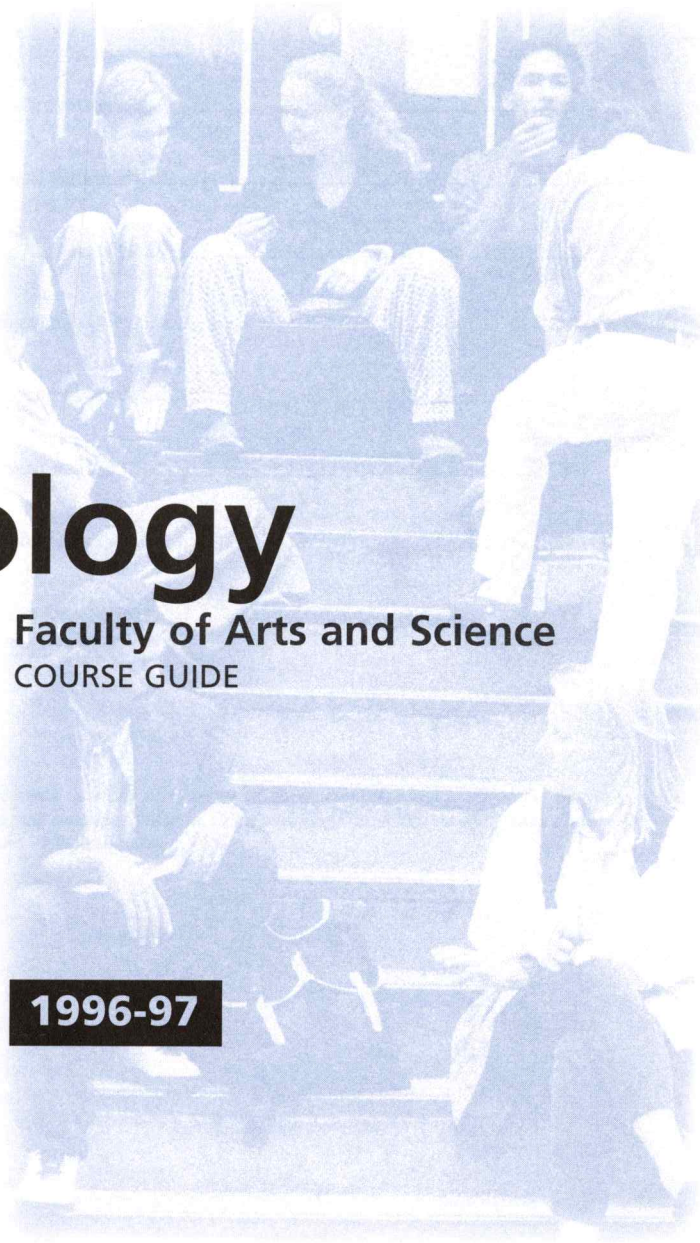

Biology

Faculty of Arts and Science

COURSE GUIDE

1996-97

Concordia
UNIVERSITY

Table of Contents

Page

The Department.....1

General Information.....2

Full-Time Faculty.....3

Programmes & Courses.....4

Selecting Courses.....11

General Requirements.....20

Helpful Hints.....21

Course Descriptions.....23

Efforts have been made to make this course guide as complete and accurate as possible. However, the text was prepared early in 1996, and some information may have changed between submission and publication.

THE DEPARTMENT

FACULTY AND STAFF

There are 25 full-time faculty members in the Biology Department and a number of adjunct professors and part-time lecturers involved in undergraduate teaching. There are 13 support staff (technicians, lab instructors and secretaries) assisting the teaching and research activities.

FACILITIES

The Biology Department offices and labs are located on the Sir George Williams Campus and most of these are situated on the 12th floor of the Hall Building. Most faculty members have their own research laboratories and a number of specialized facilities exist, including aquatic toxicology laboratories, greenhouses, environmental rooms, sterile transfer areas, animal rooms, darkrooms, instrument rooms, holding facilities for water fowl, and a scanning electron microscope lab.

GRADUATE PROGRAMMES

There are both M.Sc. and Ph.D. programmes available on both a full-time and part-time basis. The graduate programmes are traditional research and thesis degree programmes with students working under the guidance of faculty members. There are currently about 40 students in the department enrolled in these programmes. Graduate students are accepted to work in 4 general areas of specialization in the department: Animal Biology, Plant Biology, Cell-Molecular Biology and Ecology. Graduate student teaching assistants participate as demonstrators in the undergraduate laboratories. The Department also offers jointly with the Department of Chemistry and Biochemistry a Diploma Programme in Ecotoxicology in which there are approximately 50 full- and part-time students.

RESEARCH ACTIVITIES

Most faculty members in the department are active in research in one or more of the four areas of specialization previously mentioned. Research is well supported by grants and contracts from external agencies and there is a very high rate of publication in scientific journals by faculty members. Research funding allows faculty members to support graduate students, technicians, research associates, post-doctoral fellows, summer students and to purchase scientific equipment. The greatest period of research activity for most faculty members is the summer months, during which time both the department and individual faculty members traditionally hire some undergraduate students to assist in research projects.

Research seminars are presented regularly during the term, at which guest lecturers, faculty members and graduate students present results of their research to the department. Undergraduates are encouraged to attend. The presentation of seminars by students completing Independent Study (BIOL 490) research projects is a very special event each year and attracts great interest from both staff and students. A Biology students' association exist, which, aside from providing student representatives to participate in departmental functions, is involved in various social and academic activities.

CAREER OPPORTUNITIES

B.Sc. Honours or Specialization in Biology, Cell and Molecular Biology, or Ecology, constitute the basic preparation for many graduate programme (M.Sc., Ph.D. in biological and biomedical sciences, M. Ed., M. Lib. Sci., M.B.A.) and professional programme (Medicine, Dentistry, Veterinary Medicine, Law).

Graduates at the B.Sc. level may seek employment as technicians and research assistants in government, hospital, industrial and university laboratories. Those wishing to pursue more senior research or supervisory positions normally require graduate degrees.

A number of government agencies traditionally hire biology graduates including Environment Canada, Provincial Environmental Ministries, Federal and Provincial Forestry, Health and Welfare, Fisheries, and Agriculture.

In the private sector, biology graduates have been hired in the pharmaceutical and biotechnology industries, in scientific equipment sales and promotion, in control labs and in environmental consulting firms.

GENERAL INFORMATION

The main office of the Biology Department is open Monday-Friday 9 a.m. - 5 p.m. for general questions at the following location:

H-1260 - Hall Building
1455 de Maisonneuve Blvd. W.
Montreal, Quebec
H3G 1M8
Tel: (514) 848-3400 FAX: (514) 848-2881

During July and August the office is closed Friday afternoons

Faculty members are available for academic advising of students at the department level before registration. Appointments for advice may be made during periods of registration by phoning the above number. Appointments should be made by students who require extensive consultation. Newly admitted students must see an academic advisor before they can complete telephone registration.

	Telephone	Office
Department Chair		
R. M. Roy, Ph.D.	848-3390	S-H-1260-8
Associate Chair, Undergraduate Affairs		
S.M Ruby, Ph.D.	848-3400	S-H-1207-3
Graduate Programme Director		
N. Kapoor, Ph.D.	848-3403	S-H-1213-1
Honours Advisor		
J.D. McLaughlin, Ph.D.	848-3409	S-H-1211
Secretary to the Chair		
Elaine Muise	848-3402	S-H-1260-7

FULL-TIME FACULTY

Professors

P.J. Albert, Ph.D. (New Brunswick)	848-8729	H-1217-2
D.J. Fairbairn, Ph.D. (British Columbia) (on leave, 1996-97)	848-3397	H-1219-1
R.K. Ibrahim, Ph.D. (McGill) (on leave, 1996-97)	848-3399	H-1261
E.J. Maly, Ph.D. (Princeton) (on leave until December 1996)	848-3408	H-1225-1
E.B. Newman, Ph.D. (Radcliffe)	848-3410	H-1247
R.M. Roy, Ph.D. (Toronto)	848-3390	H-1260-8
R. Sheinin, Ph.D. (Toronto)	848-3400	T.B.A.

Associate Professors

P.D. Anderson, Ph.D. (Oregon State)	848-3391	K-307 (2150 Bishop)
C. Beckman, Ph.D. (Rutgers)	848-3393	H-1237-1
R.T. Cronin, Ph.D. (Fordham)	848-3394	H-601
C.G. Cupples, Ph.D. (York) (on leave 1996-97)	848-3427	H-1255-3
K.S. Dhindsa, Ph.D. (Helsinki)	848-3395	H-1245-1
L.-A. Giraldeau, Ph.D. (McGill)	848-3425	H-1237-21
J.W.A. Grant, Ph.D. (Guelph)	848-3421	H-1255-5
P.J. Gulick, Ph.D. (U.C. Davis)	848-3407	H-1253-1
M.B. Herrington, Ph.D. (McMaster)	848-3398	H-1255
N.N. Kapoor, Ph.D. (McMaster)	848-3403	H-1213-1
B.S. Mangat, Ph.D. (London)	848-3406	H-1280-2
J.D. McLaughlin, Ph.D. (New Brunswick)	848-3409	H-1211-1
S.M. Ruby, Ph.D. (Western)	848-3400	inquire in H-1260
R.K. Storms, Ph.D. (Alberta) (on leave 1996-97)	848-3412	H-1253-5
A. Tsang, Ph.D. (York)	848-3405	H-1259-1
P. Widden, Ph.D. (Calgary)	848-3413	H-1209-1

Assistant Professors

J.A. Kornblatt, Ph.D. (Cincinnati)	848-3404	H-1207
L. Varin, Ph.D. (Concordia)	848-3400	H-1206

Professional and Technical Staff

D. Beattie (Technician)	848-3419	H-1235-12
P. Gill (Head Technician)	848-3411	H-1253-4
R. Harris (Technical Officer)	848-3414	H-1260-2
M. Harvey (Technician)	848-3418	H-1207
S. Mikhail (Technician)	848-3424	H-1201-3
I. Menaggia (Technician)	848-3417	H-1271-1
S. Parisella (Technician)	848-3371	H-1253-2
J. Rokas (Technician)	848-3419	H-1226
A. Spurmanis (Technician)	848-3417	H-1272

Secretarial Staff

E. Muise (Secretary to the Chair)	848-3402	H-1260-7
L. Morris (Secretary)	848-7335	H-1260-4
D. Bisanti (Secretary)	848-3400	H-1260-3
W. Legaré (Graduate Secretary)	848-3401	H-1260-3

PROGRAMMES & COURSES

The Biology Department offers a wide variety of courses in plant biology, animal biology, ecology and cell and molecular biology. Programmes are designed to give the student a broad background in the biological sciences and to allow specialization and diversification according to the interests of the individual student. The programmes are highly flexible and require guidance from faculty advisors so that students can take full advantage of the range of options available.

Although the Biology Department offers Honours, Specialization, Major and Minor programmes, we recommend that students wishing to pursue careers in Biology take either an Honours or Specialization programme in Biology, Cell and Molecular Biology, or Ecology. Entry into the Honours programme usually occurs after completion of 30 credits. The Major and Minor programme are not designed to provide an extensive enough background in Biology for students to progress to careers in the discipline. The Major should be considered by students requiring a less specialized degree, with a Biology concentration, or as part of a double-major programme. The minor is designed to be flexible and allow a student whose area of concentration is outside of Biology to take courses to provide either a general survey or to gain a more in-depth understanding of one of the major areas of Biology.

COURSE NUMBERING

Normally all courses with CEGEP prerequisites or no prerequisites will be 200-level, and most commonly are taken by students in first year (within 30 credits), or as electives in later years. Those courses with 200-level prerequisites will be 300-level, and normally are taken by students in second or third year. Likewise those courses with 300-level prerequisites and/or 400-level co-requisites will be 400-level. Prerequisites to courses can only be waived by obtaining the written permission of the instructor, Chair or Associate Chair prior to registration. Students in first year may take 300-level courses provided they have the prerequisites.

BIOLOGY COURSES NOT AVAILABLE FOR CREDIT TO STUDENTS IN BIOLOGY PROGRAMME

The following courses are intended to be taken as electives in non-biology programmes:

200 - Fundamentals of Human Biology
201 - Introductory Biology
203 - Fundamental Nutrition
206 - Elementary Genetics
207 - Microorganisms and Humanity
208 - Environmental Biology
210 - Genetics and Human Welfare

SLOT COURSES - BIOL 298, 398 and 498

Special Topics in Biology (BIOL 298), Intermediate Topics in Biology (BIOL 398) and Advanced Topics in Biology (BIOL 498) are scheduled annually and provide the opportunity for further study in various areas of concentration. The course numbers and Special Topics, as well as prerequisites are described in the Annual Undergraduate Class Schedule. Each is identified by a 3-digit number plus a letter A to Z. For example, BIOL 498D, Advanced Topics in Biology (Special Topic: Virology).

CEGEP COURSES AND EQUIVALENTS

CEGEP profile 10.9 satisfies requirements for entry into Biology programmes. CEGEP profiles 10.10 and 5.00 (the new Natural Science programme) are more than sufficient. Students lacking required CEGEP courses will be asked to include these as part of their Concordia degree requirements. The following CEGEP equivalent courses are available:

Concordia courses	CEGEP equivalents
Biology 201	Biology 301
Chemistry 205	Chemistry 101
Chemistry 206	Chemistry 201
Mathematics 203	Mathematics 103
Mathematics 205	Mathematics 105
Physics 204, 224	Physics 101
Physics 205, 225	Physics 201
Physics 206, 226	Physics 301

UNDERGRADUATE PROGRAMMES

The curriculum in the department has been modernized in the past three years. Students now have the option of specializing in biology, cell and molecular biology, or ecology. Several new courses have been implemented to provide a common core course sequence for all students in the various programmes.

Students who registered in a biology programme prior to 1994 can follow either the old or the new degree requirements. Students who entered the university in September 1994 have the option of following the transition degree requirements or the new degree requirements. This booklet outlines the new degree requirements only. Students can examine copies of the 1994-95 course guide from the main office of the Biology Department to determine old and transition degree requirements. **All students entering the Biology programmes since September 1995 must follow the new programme as outlined on the following pages.**

Some students following the old and transition programme may not be able to complete normal requirements because many core courses from the old programme have been dropped from the curriculum. These students should consult with the Associate Chair, Student Affairs to determine appropriate substitutions for courses no longer offered.

UNDERGRADUATE PROGRAMME

The Department offers programmes leading to B.Sc. Honours or Specialization in Biology, Cell and Molecular Biology and Ecology as well as programmes leading to B.Sc., Major in Biology or Minor in Biology. These programmes are based on a common core course sequence.

CORE COURSE NUMBERS:

*CHEM 221	Organic Chemistry I
*CHEM 222	Organic Chemistry II
CHEM 271	Biochemistry
BIOL 261	Molecular & General Genetics
BIOL 266	Cell Biology
BIOL 367	Molecular Biology
BIOL 225	Biology of Organisms I
BIOL 226	Biology of Organisms II
BIOL 227	Laboratory Studies of Organisms
BIOL 322	Biostatistics

*Students who have completed CEGEP Organic Chemistry courses will replace these with Biology elective credits.

72-credit Honours in Biology

24 credits
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]
- Independent Study[6]

9 credits
- Biology of Organisms I[3]
- Biology of Organisms II[3]
- Laboratory Studies of Organisms[3]

3 credits from:
- Biostatistics[3]
- Analytical Chemistry[3]

3 credits from:
- Animal Physiology I[3]
- Animal Physiology II[3]
- Physiology of Plant Development[3]
- Plant Nutrition and Metabolism[3]
- Cell Physiology[3]

33 credits from:
Biology courses selected freely with a minimum of 12 credits at 300-level and 9 credits at 400-level. Students may wish to concentrate these electives to follow a concentration in Animal Biology, Plant Biology, Environmental Biology or Microbiology and Biotechnology (pages 15-18).

60-credit Specialization in Biology

18 credits
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]

9 credits
- Biology of Organisms I[3]
- Biology of Organisms II[3]
- Laboratory Studies of Organisms[3]

3 credits from:
- Biostatistics[3]
- Analytical Chemistry[3]

3 credits from:
- Animal Physiology I[3]
- Animal Physiology II[3]
- Physiology of Plant Development[3]
- Plant Nutrition and Metabolism[3]
- Cell Physiology[3]

27 credits from:
Biology courses selected freely with a minimum of 12 credits at 300-level and 6 credits at 400-level. Students may wish to concentrate these electives to follow a concentration in Animal Biology, Plant Biology, Environmental Biology or Microbiology and Biotechnology (p. 15-18).

45-Credit Major in Biology

18 credits
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]

9 credits
- Biology of Organisms I[3]
- Biology of Organisms II[3]
- Laboratory Studies of Organisms[3]

3 credits from:
- Biostatistics[3]
- Analytical Chemistry[3]

3 credits from:
- Animal Physiology I[3]
- Animal Physiology II[3]
- Physiology of Plant Development[3]
- Plant Nutrition and Metabolism[3]
- Cell Physiology[3]

12 credits from:
Biology courses selected freely with a minimum of 9 credits at 300-level and 3 credits at 400-level.

24-Credit Minor in Biology

12 Credits from
- Biology of Organisms I[3]
- Biology of Organisms II[3]
- Laboratory Studies of Organisms[3]
- Molecular and General Genetics[3]
- Cell Biology[3]

12 Credits from additional Biology courses

72-Credit Honours in Cell-Molecular Biology

42 credits
- Analytical Chemistry[3]
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]
- Cell Physiology[3]
- Biochemistry II[3]
- Genetics and Cell Biology Lab[3]
- Advanced Laboratory in Molecular Biology[3]
- Advanced Biochemistry Lab[3]
- Independent Study[6]

6 credits
- Biology of Organisms I[3]
- Biology of Organisms II[3]

9 credits from:
- 300-level Biology courses

15 credits from:
- 400-level Biology and Chemistry courses with at least 9 credits in Cell Molecular courses from the following: Radiation Biology[3], Plant Biochemistry[3], Advanced Genetics[3], Immunology[3], Advanced Cell Physiology[3], Biological Regulatory Mechanisms[3], Gene Structure[3], DNA Repair[3], Microbial Physiology[3], Mechanisms of Protein Synthesis[3], Plant Molecular Genetics[3], Biochemistry and Genetics of Disease[3], Virology[3], and at least 3 credits in 400-level Biochemistry from the following: Enzyme Kinetics and Mechanisms[3], Chemical Toxicology[3], Medicinal Chemistry I[3], Medicinal Chemistry II[3], Hormone Biochemistry[3], Bioinorganic Chemistry[3], Plant Biochemistry[3]

66-credit Specialization in Cell and Molecular Biology

36 credits
- Analytical Chemistry[3]
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]
- Cell Physiology[3]
- Biochemistry II[3]
- Genetics and Cell Biology Lab[3]
- Advanced Laboratory in Molecular Biology[3]
- Advanced Biochemistry Lab[3]

6 credits
- Biology of Organisms I[3]
- Biology of Organisms II[3]

9 credits from:
- 300-level Biology courses

15 credits from:
- 400-level Biology and Chemistry courses with at least 9 credits in Cell Molecular courses from the following: Radiation Biology[3], Plant Biochemistry[3], Advanced Genetics[3], Immunology[3], Advanced Cell Physiology[3], Biological Regulatory Mechanisms[3], Gene Structure[3], DNA Repair[3], Microbial Physiology[3], Mechanisms of Protein Synthesis[3], Plant Molecular Genetics[3], Virology[3], Biochemistry and Genetics of Disease[3] and at least 3 credits in 400-level Biochemistry from the following: Enzyme Kinetics and Mechanisms[3], Chemical Toxicology[3], Medicinal Chemistry I[3], Medicinal Chemistry II[3], Hormone Biochemistry[3], Bioinorganic Chemistry[3], Plant Biochemistry[3]

72-credit Honours in Ecology

36 credits
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Biology of Organisms I[3]
- Laboratory Studies of Organisms[3]
- Biology of Organisms II[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]
- Biostatistics[3]
- Independent Study[6]

3 credits from:
- Animal Physiology I[3]
- Animal Physiology II[3]
- Physiology of Plant Development[3]
- Plant Nutrition and Metabolism[3]
- Cell Physiology[3]

33 credits from:
- Elective courses in Ecology and related fields with at least 21 credits at 300- and 400- level from the following:

  Evolution[3], Plant Field Ecology[3], Fundamentals of Limnology[3], Microbial Ecology[3], Introduction to Animal Behaviour[3], Evolutionary Ecology[3], Biology of Pollutants[3], Intermediate Concepts in Ecology[3], Biology of Fishes[3], Ecological Genetics[3], Behavioral Ecology and Sociobiology[3], Population Ecology[3], Current Advances in Ecological Research[3]

60-credit Specialization in Ecology

30 credits
- Organic Chemistry I[3]
- Organic Chemistry II[3]
- Biochemistry[3]
- Biology of Organisms[3]
- Biology of Organisms II[3]
- Laboratory Studies of Organisms[3]
- Molecular and General Genetics[3]
- Cell Biology[3]
- Molecular Biology[3]
- Biostatistics[3]

3 credits from:
- Animal Physiology I[3]
- Animal Physiology II[3]
- Physiology of Plant Development[3]
- Plant Nutrition and Metabolism[3]
- Cell Physiology[3]

27 credits from
- Elective credits in Ecology and related fields with at least 18 credits at 300 - or 400-level from the following: Evolution[3], Plant Field Ecology[3], Fundamentals of Limnology[3], Microbial Ecology[3], Introduction to Animal Behaviour[3], Evolutionary Ecology[3], Biology of Pollutants[3], Intermediate Concepts in Ecology[3], Biology of Fishes[3], Ecological Genetics[3], Behavioral Ecology and Sociobiology[3], Population Ecology[3], Current Advances in Ecological Research[3]

SELECTING COURSES

First year students must consult a faculty advisor and should tentatively plan ahead for the following year. It is important that students be aware of the prerequisite courses that are required by advanced-level courses. For example, Biology 453 requires BIOL 358 which in turn requires BIOL 226. It is not possible to take all three of these courses in one academic year. In some cases a student may have to take a prerequisite course in the first year in order to take a desired course in the third year because of other prerequisite courses. So planning is necessary to assure an adequate background to allow entry to the required number of 300- and 400- level courses. In exceptional circumstances, prerequisites may be waived by written permission of course instructors. The proposed schedule of course offerings in 1995-96 and 1996-97 is given with the course descriptions (pages 23 to 55)

Students should not assume that all courses will be presented each year. Some of our elective courses may not appear in a given year. This does not apply to required courses; these are normally scheduled twice annually. Students are free to select courses in day or evening division. Many day students find the availability of evening courses an advantage in arranging their schedule.

In addition to specializing in either Cell and Molecular Biology or Ecology, students registered in Honours or Specialization programme in Biology may concentrate their studies in Animal Biology, Plant Biology, Environmental Biology or Microbiology and Biotechnology. It is also possible to select courses in preparation for admission to professional programmes in the Health Sciences. The following pages contain suggestions for sequences of core courses for the different concentrations.

SUGGESTED COURSES FOR FIRST-YEAR STUDENTS

Most students are normally accepted into a 90-credit programme (Major or Specialization in Biology or Specialization in Cell and Molecular Biology or Ecology).

All students should try to complete most of the 200-level core courses in first year or at the latest by the end of the Fall semester of the second year of full-time study. It is quite demanding to complete all of these courses in the first two terms of study unless Organic Chemistry has been completed in CEGEP.

All full-time students in all programmes should try to complete at least CHEM 221, BIOL 261 and BIOL 225 or 226 by the end of the first semester and CHEM 222, CHEM 271, BIOL 266 and BIOL 225 or 226 by the end of the second semester. Ideally, students may also be able to complete BIOL 227 during the second semester; however, this course may be deferred to the third semester of study in some cases. Students in Cell and Molecular Biology do not require this course; however, it is a pre-requisite or co-requisite to most Animal Biology and Plant Biology electives. In addition to the above, students in Cell and Molecular Biology programmes should complete CHEM 212 by the end of the second semester (CHEM 217 may be substituted with permission). Students who have completed Organic Chemistry I and Organic Chemistry II are exempted from CHEM 221 and CHEM 222 and can accelerate their core programme but must replace these courses with Biology electives.

Some students may be accepted into the 108-credit programme . These students need to take CHEM 205, CHEM 206, BIOL 201, MATH 203, MATH 205, PHYS 204, PHYS 205, PHYS 224, and PHYS 225 in their programme. For these students, **it is imperative that BIOL 201 and Chem 205 be done in the first semester**. These students should try to adhere to the following schedule:

Fall semester: BIOL 201, CHEM 205, MATH 205, PHYS 204, PHYS 224.
Winter semester: CHEM 206, BIOL 225, BIOL 226, MATH 205, PHYS 205, PHYS 225

If this course load appears to be too heavy, postpone MATH 205 and PHYS 205 until your second year.

Some students (normally these coming from outside Québec) have been accepted into the 120-credit programme . Those students must take PHYS 206 and PHYS 226 in addition to those courses needed in the 108-credit programme described above. The recommended first year sequence is identical to that for students in the 108-credit programme. Again, we stress the importance of completing CHEM 205, CHEM 206, and BIOL 201 as soon as possible.

Students from other provinces and other countries are generally accepted into the 120-credit programme . It is possible that some students have been given credit for some of the courses required in the 120-credit programme . It is also possible that some students may deserve advanced standing (credits actually given) or exemptions (course is not required, but must be replaced by another course) for some courses. These students should consult the Associate Chair, Student Affairs. Bring copies of your high school, college or university academic records.

SUGGESTED COURSE SEQUENCES AND ELECTIVES FOR STUDENTS INTENDING TO SPECIALIZE IN PARTICULAR AREAS OF BIOLOGY

	PAGE
Programme in Cell and Molecular Biology	13
Programme in Ecology	14
Programme in Biology:	
Concentration in Animal Biology	15
Concentration in Plant Biology	16
Concentration in Environmental Biology	17
Concentration in Microbiology and Biotechnology	18
Concentration in Pre-professional Health Science Stream	19

The courses listed on the following pages are not necessarily degree requirements; these course listings are designed to help you arrange appropriate schedules and select appropriate electives for your particular interests.

SUGGESTED SEQUENCES AND ELECTIVES FOR PROGRAMME IN CELL AND MOLECULAR BIOLOGY

Core Courses:

Year I: 200-level core courses
Analytical Chemistry for Biologists (CHEM 212)[3]

Year II: Cell Physiology (364)[3]
Molecular Biology (367)[3]
Genetics and Cell Biology Lab (368)[3]
Biochemistry II (CHEM 375)[3]

Year III: Advanced Biochemistry Lab (CHEM 479)[3]
Advanced Molecular Biology Lab (466)[3]

Cell and Molecular Biology and Biochemistry Electives:

Year II-III: Radiation Biol. and Radiotracer Meth. (420)[3]
Plant Biochemistry (441)[3]
Advanced Genetics (461)[3]
Immunology (462)[3]
Advanced Cell Physiology (464)[3]
Biological Regulatory Mechanisms (465)[3]
Gene Structure (468)[3]
DNA Repair (469)[3]
Microbial Physiology (470)[3]
Biochemistry and Genetics of Disease (498A)[3]
Mechanisms of Protein Synthesis (498V)[3]
Virology (498D)
Plant Molecular Genetics (498X)[3]
Enzyme Kinetics and Mechanics (CHEM 471)[3]
Chemical Toxicology (CHEM 472)[3]
Medicinal Chemistry I (CHEM 473)[3]
Medicinal Chemistry II (CHEM 474)[3]
Hormone Biochemistry (CHEM 478)[3]
Bio-organic Chemistry (CHEM 481)[3]

Related Courses in Biology:

Biostatistics (BIOL 322)[3]
Plant Growth and Development (346)[3]
Plant Nutrition and Metabolism (349)[3]
Mechanisms of Development (366)[3]
Microbiology (370)[3]
Animal Physiology I (383)[3]
Animal Physiology II (384)[3]

SUGGESTED SEQUENCES AND ELECTIVES FOR PROGRAMME IN ECOLOGY

Core Courses:

Year I: 200-level core courses
Biology of Organisms I & II (225[3]; 226[3])

Year II: Biostatistics (322)[3]
Laboratory Studies of Organisms (227)[3]

3 credits from:
Animal Physiology I (383)[3] and II (384)[3]
Physiology of Plant Development (346)[3]
Plant Nutrition and Metabolism (349)[3]
Cell Physiology (364)[3]

Ecology Electives:

Year II-III: Plant Field Ecology (352)[3]
Fundamentals of Limnology (355)[3]
Microbial Ecology (356)[3]
Introduction to Animal Behaviour (358)[3]
Evolutionary Ecology (359)[3]
Intermediate Concepts in Ecology (398A)[3]
Ecological Genetics (452)[3]
Behavioral Ecology & Sociobiology (453)[3]
Population Ecology (454)[3]
Current Advances in Ecological Research (456)[3]

Courses in Related Areas of Biology:

Entomology I (232)[3]
Entomology II (233)[3]
Invertebrate Zoology I (337)[3]
Invertebrate Zoology II (338)[3]
Parasitology (332)[3]
Biology of Algae (344)[3]
Biology of Pollutants (381)[3]
Insect Behavioral Ecology (398D)
Biology of Fishes (431)[3]
Comparative and Environmental Physiology (432)[3]
Intermediate Statistics (482)[3]

Elective Courses* Outside the Department:

Oceanography (GEOL 202)[3]
Intro. Environmental Geology (GEOL 203)[3]
Habitat and Society (GEOG 202)[3]
Natural Environment (GEOG 271)[3]
The Sea (GEOG 273)[3]
Climate and the Biosphere (GEOG 275)[3]
Landforms and the Biosphere (GEOG 276)[3]
Tropical Rain Forests (GEOG 371)[6]
Analysis of the Environment (GEOG 372)[6]
Climatology (GEOG 373)[6]

*In some instances, students may be granted permission to use these as Biology electives.

SUGGESTED SEQUENCES AND ELECTIVES FOR BIOLOGY PROGRAMME WITH CONCENTRATION IN ANIMAL BIOLOGY

Core Courses:

Year I: 200-level core courses
Biology of Organisms I & II (225[3], 226[3])

Year II: Laboratory Studies of Organisms (227)[3]
Animal Physiology I (383)[3] and II (384)[3]
Biostatistics (322)[3]
Molecular Biology (367)[3]

Animal Biology Electives:

Year II-III: Entomology I (232)[3]
Entomology II (233)[3]
Comparative Vertebrate Anatomy (331)[6]
Parasitology (332)[3]
Vertebrate Embryology (334)[3]
Histology I (335)[3]
Histology II (336)[3]
Invertebrate Zoology I (337)[3]
Invertebrate Zoology II (338)[3]
Insect Behavioral Ecology (398D)[3]
Biology of Fishes (431)[3]
Comparative Environmental Physiology (432)[3]

Courses in Related Areas of Biology:

Evolution (321)[3]
Introductory Animal Behaviour (358)[3]
Cell Physiology (364)[3]
Genetics and Cell Biology Laboratory (368)[3]
Behaviourial Ecology and Sociobiology (453)[3]

Elective Courses* Outside Department:

Fundamentals of Behavioral Neurobiology (PSYC 358)[3]
Neuropsychology (PSYC 359)[3]
Psychology of Drug Dependence (PSYC 361)[3]
Psychobiology of Learning and Memory (PSYC 362)[3]
Introduction to Behavioral Medicine (PSYC 364)[3]
Psychobiology of Sensation and Perception (PSYC 365)[3]
Animal Behaviour (PSYC 366)[6]
Psychobiology of Motivated Behavior (PSYC 367)[3]
Hormones and Behaviour (PSYC 369)[3]

* In some instances, students may be granted permission to use these as Biology electives.

SUGGESTED SEQUENCES AND ELECTIVES FOR BIOLOGY PROGRAMME WITH CONCENTRATION IN PLANT BIOLOGY

Core Courses:

Year I: 200-level core courses
BIOL of organisms I and II (225[3], 226[3])

Year II: Laboratory Studies of Organisms (227)[3]
Physiology of Plant Development (346)[3]
Plant Nutrition and Metabolism (349)[3]
Biostatistics (322)[3]
Molecular Biology (367)[3]

Plant Biology Electives:

Year II-III:

Biology of Algae (344)[3]
Plant Interactions with Other Organisms (398C)[3]
Perspect. Plant Tissue Culture & Biotech. (442)[3]
Plant Field Ecology (352)[3]
Microbial Ecology (356)[3]
Plant Biochemistry (441)[3]
Plant Molecular Genetics (498X)[3]

Related Courses in Biology:

Cytogenetics (363)[3]
Cell Physiology (364)[3]
Genetics and Cell Biology Laboratory (368)[3]

Elective Courses* Outside the Department:

Analytical Chemistry for Biologists (CHEM 212)[3]
Natural Products (CHEM 326)[3]
Intermediary Metabolism (CHEM 375)[3]
Habitat and Society (GEOG 202)[3]
Natural Environment (GEOG 271)[3]
Landforms and the Bioshphere (GEOG 276)[3]
Tropical Rain Forests (GEOG 371)[6]
Analysis of the Environment (GEOG 372)[6]

*In some instances, students may be granted permission to use these as Biology electives.

SUGGESTED SEQUENCES AND ELECTIVES FOR BIOLOGY PROGRAMME WITH CONCENTRATION IN ENVIRONMENTAL BIOLOGY

Core Courses:

Year I: 200-level core courses
Biology of Organisms I & II (225[3], 226[3])
Analytical Chemistry for Biologists (CHEM 212[3])

Year II: Laboratory Studies of Organisms (227)[3]
Biostatistics (322)[3]
Plant Nutrition and Metabolism (349)[3]
Molecular Biology (367)[3]
Animal Physiology I (383)[3] and II (384)[3]

Environmental Biology Electives:

Year II-III: Invertebrate Zoology I (234)[3]
Invertebrate Zoology II (235)[3]
Biology of Algae (344)[3]
Fundamentals of Limnology (355)[3]
Microbial Ecology (356)[3]
Evolutionary Ecology (359)[3]
Cell Physiology (364)[3]
Intermediate Microbiology (370)[3]
Biology of Pollutants (381)[3]
Intermediate Concepts in Ecology (398A)[3]
Plant Interactions with other Organisms (398C)[3]
Radiation Biology and Radiotracer Meth. (420)[3]
Biology of Fishes (431)[3]
Comparative and Environmental Physiology (432)[3]
Population Ecology (454)[3]
Current Advances in Ecological Research (456)[3]
Intermediate Statistics (482)[3]

Elective Courses* Outside Department:
Biochemistry II (CHEM 375)[3]
Chemical Toxicology (CHEM 472)[3]
Habitat and Society (GEOG 202)[3]
Introduction to Human Geography (GEOG 211)[3]
The Natural Environment (GEOG 271)[6]
The Sea (GEOG 273)[6]
Climate and Biosphere (GEOG 275)[3]
Land Form and the Bioshphere (GEOG 276)[3]
Biogeography (GEOG 371)[6]
Analysis of Environment (GEOG 372)[6]
Oceanography (GEOL 202)[3]
Introduction to Environmental Geology (GEOL 203)[3]
Intro. to Science and Human Affairs I (SCHA 250)[3]
Intro. to Science and Human Affairs II (SCHA 251)[3]
Environmental Issues I (SCHA 253)[3]
Environmental Issues II (SCHA 254)[3]
Science and Public Policy (SCHA 453)[6]

*In some instances, students may be granted permission to use these as Biology electives.

SUGGESTED SEQUENCES AND ELECTIVES FOR BIOLOGY PROGRAMME WITH CONCENTRATION IN MICROBIOLOGY AND BIOTECHNOLOGY

Core Courses:

Year I: 200-level core courses
Analytical Chemistry for Biologists (CHEM 212)[3]

Year II: Cell Physiology (364)[3]
Molecular Biology (367)[3]
Genetics and Cell Biology Laboratory (368)[3]
Microbiology (370)[3]

Year III: Advanced Laboratory in Molecular Biology (466)[3]
Microbial Physiology (470)[3]

Biology Electives:

Year II and III:
Plant Nutrition and Metabolism (346)[3]
Plant Growth and Development (349)[3]
Cytogenetics (363)[3]
Plant Biochemistry (441)[3]
Perspectives in Plant Tissue Culture and Plant Biotechnology (442)[3]
Advanced Genetics (461)[3]
Immunology (462)[3]
Advanced Cell Physiology (464)[3]
Regulatory Mechanisms (465)[3]
Gene Structure (468)[3]
DNA Repair (469)[3]
Virology (498D)[3]
Mechanisms of Protein Synthesis (498V)[3]
Plant Molecular Genetics (498X)[3]

Elective Courses* Outside the Department:
Biochemistry II (CHEM 375)[3]
Enzyme Kinetics and Mechanisms (CHEM 471)[3]
Advanced Biochemistry Laboratory (CHEM 479)[3]

*In some instances, students may be granted permission to use these as Biology electives.

SUGGESTED SEQUENCES AND ELECTIVES BIOLOGY PROGRAMMES WITH CONCENTRATION IN PRE-PROFESSIONAL HEALTH SCIENCES

Core Courses:

Year I: 200-level core courses

Year II: Animal Physiology I (383)[3] and II (384)[3]
Cell Physiology (364)[3]
Biostatistics (322)[3]
Molecular Biology (367)[3]

Biology Electives:

Year II-III: Comparative Vertebrate Anatomy (331)[6]
Parasitology (332)[3]
Vertebrate Embryology (334)[3]
Histology I (335)[3]
Histology II (336)[3]
Cytogenetics (363)[3]
Genetics and Cell Biology Lab (368)[3]
Microbiology (370)[3]
Nutrition (380)[3]
Radiation Biol. Radiotracer Meth. (420)[3]
Immunology (462)[3]
Developmental Biology (463)[3]
Advanced Cell Physiology (464)[3]
Cytogenetics (363)[3]
DNA Repair (469)[3]
Virology (498D)[3]

Elective Courses* Outside the Department:

Biochemistry II (CHEM 375)[3]
Enzyme Kinetics and Mechanisms (CHEM 471)[3]
Chemical Toxicology (CHEM 472)[3]
Medicinal Chemistry I (CHEM 473)[3]
Medicinal Chemistry II (CHEM 474)[3]
Hormone Biochemistry (CHEM 478)[3]
Introduction to Psychology (PSYC 200)[6]
Research Methods in Exper. Psychology I (PSYC 310)
Developmental Psychology (PSYC 330)[6]
Psychology of Drug Dependence (PSYC 361)[3]
Introduction to Behaviourial Medicine (PSYC 364)[3]
Psychobiology of Sensation and Perception (PSYC 365)[3]
Hormones and Behaviour (PSYC 369)[3]

*In some instances, students may be granted permission to use these as Biology electives.

GENERAL REQUIREMENTS

General Education Electives

The B.Sc. in Biology, Cell and Molecular Biology, or Ecology currently requires successful completion of a minimum of 90 credits in an approved sequence of courses in either a 45-credit Major, 60-66 credit Specialization or 72-credit Honours Programme. The balance of credits may be taken in cognate areas or any area that meets the interests or career objectives of the individual student. The Biology Department, as a unit of the Faculty of Arts and Science, is committed to a balance between specialized and general education. Students must complete a minimum of 24 credits outside the single discipline or department from which the degree concentration has been chosen. Within every block of 30 credits (usual course load for 2 terms of full-time study), a Biology student will normally choose no more than 24 credits in Biology. In the case of Biology programmes, all courses presented by other departments (even with some Biology content) qualify as being outside the discipline. For example, Organic Chemistry, Biochemistry, Pharmacology, Medicinal Chemistry or Physiological Psychology qualify as electives which will satisfy general education requirements. Under some circumstances students may also be allowed to take such courses in place of Biology electives.

Language Proficiency

All students completing a bachelor's degree programme must give proof of acceptable writing skills as a condition of graduation. The only exceptions are those already tested prior to admission (Concordia English Language Diagnostic Test, Test of English as a Foreign Language or University of Michigan English Language Test). The graduation requirement must be met either by passing the University Writing Test (UWT) or by obtaining a specific grade in a designated language course: ENGL 212 or FRAN 400. The UWT involves writing a short composition in English or French on the student's choice of one of several topics. The test is offered several times a year and may be taken as often as necessary. Students are not charged a fee and unsuccessful attempts do not appear on a student's record. Students are encouraged to take the UWT as soon as possible in case a remedial course is required.

The language of instruction in Biology at Concordia is English but assignments and examinations may be submitted in French. The language proficiency requirement may be satisfied in either English or French.

Performance Regulations

All students are required to achieve an acceptable standard of scholarship. Academic Standing is determined on the basis of an Annual Weighted Grade Point Average (WPGA) described in section 16.3.10 of the undergraduate calendar. In the Faculty of Arts and Science, a student must maintain an Annual WGPA of at least 2.00 ("C" average). Students with Annual WGPA of less than 2.00 but at least 1.50 are put on Conditional Standing. A student is not permitted to obtain two consecutive Conditional Standing Assessments. See section 31.0031 of the undergraduate calendar for further details. In addition to the general performance requirements, students in the Honours programme can have no grade less than C (2.0) in any core or elective course. Honours students must maintain an annual GPA of no less than B- (2.7) in Honours core courses, a cumulative GPA of no less than B (3.0) in the Honours core and a minimum B (3.0) cumulative GPA on record at the time of graduation.

Colleges

The Faculty of Arts and Science provides opportunities for study in smaller academic units. There are currently 5 Colleges in operation, one of which, Science College, is particularly suitable for students in Biology programmes. Each unit is composed of a group of students and Fellows (professors) who are united by a particular philosophy of education. Each unit has a physical location of its own, where its students may gather to exchange ideas, whether in the classroom or in one of the lounges provided for such interaction.

Refer to section 31.550 of the undergraduate calendar for a description of the Science College and its 30-credit curriculum which may be taken in combination with the regular Biology Majors, Specialization or Honours programmes.

HELPFUL HINTS

Course Exemptions

Course exemptions can be obtained at the time of admission or during the programme for certain courses taken at CEGEP or at other universities and colleges. Discuss this with the admissions office when applying. Students may be granted permission to complete approved courses at other institutions when equivalent courses are unavailable at Concordia. Requests for permission to take courses at other institutions, or electives in other departments for biology elective credit, course overloads or exemptions from normal requirements may be submitted to the Associate Chair, Student Affairs, on student request forms available in the Biology office.

Course Load

Normally students will complete no more than 30 credits in the Fall-Winter semester and no more than 12 credits in Summer. One should make every effort to take approximately 15 credits per semester and balance the number of courses with labs between semesters. Four lab periods per week in one semester is an extremely demanding commitment, not only in terms of the lab time, but also the preparation and subsequent writing of lab reports. Students may request permission to register for more than 15 credits per semester.

Closed Course Sections

During registration, students who delay in calling the telephone registration system (CARL) may find that some course sections are closed. The first solution to this problem is to keep calling CARL in the hope that somebody has dropped the course or changed sections. During the first week of classes, some students opt out of particular courses. In many instances, maximum enrolments are set by either the size of the classroom or the amount of laboratory space and equipment. Occasionally, space is not a problem and in these instances, students should approach the instructor of the course to obtain written permission to enter. Having obtained this permission, students should check with either the Associate Chair or the Biology Department Chair's secretary to ascertain if capacity can be increased. If you can be accommodated you will be given permission to enter the course.

Students in other Programmes

During registration, students not in Biology programme often inquire at the Biology Department office about their inability to enter some particular course. In many cases, it is because most of our courses are restricted to biology and biochemistry students, or portions are restricted to students in other departments (psychology, geology, geography) who require these courses for their degree. Independent students have lowest priority for registration; however, these restrictions are usually dropped during the final two days of registration. Students who are currently majors in other departments or who are independent but plan to switch into biology should schedule appointments with the Associate Chair, Student Affairs. Entry into restricted courses may be permitted depending upon the seriousness of academic intent.

Out of Province Students

Students entering Concordia from out-of-province or out-of-country schools may have some trouble registering for courses because CARL (Concordia Automated Response Line) will only accept requests to register if the Concordia (or CEGEP) pre-requisites have been met. Students who feel that they have pre-requisites that the Admissions Office missed should arrange interviews with that office to discuss background. If the Admissions Office is unable to satisfy you, you should arrange an interview with the Associate Chair, Student Affairs. Bring copies of transcripts. For those unable to travel to Montreal before the start of the term, it is possible to carry our advising by fax or telephone.

Exemption from Pre-requisites

Students who feel they are qualified to enter a particular course without the normally required prerequisites should consult with the course instructor. If the instructor agrees that the student may enter the course, he/she should write a note to that effect and present it to Elaine Muise (Secretary to the Chair, H-1260-7) or to Dr. Sylvia Ruby (Associate Chair, Student Affairs, H-1207-3)

Elaine Muise (H-1260-7, phone 848-3402) can help students with questions and problems concerning registration; she will direct students to the Associate Chair or the Chair regarding problems that require academic counselling.

BIOLOGY 200 - FUNDAMENTALS OF HUMAN BIOLOGY

(6 credits) - lectures only
Offered fall & winter 1996-97

Instructor T.B.A.

Description This course is designed to undertake the study of fundamental biological mechanisms that organize the human body into the most specialized organism. Life processes of the human being will be dealt with through structural, physiological, developmental evolutionary, hereditary and environmental approaches. Human body systems, such as digestive, circulatory, immune, respiratory and excretory will be correlated through their activities to homeostasis. Likewise, the vital role of the coordination of other systems, like the nervous, sensory, musculoskeletal, endocrine and reproductive, will be studied. The course probes problems not only of organization and functions, but also of health and disease.

Students are encouraged to participate in the discussions related to the subject matter of this course. The course should prove useful for those engaged in psychological, sociological and economic studies.

Assignments & Grading Students are evaluated on the basis periodic quizzes, a midterm and final examination.

Prerequisite None

Note: Students who have taken CEGEP 921/931 may not take this course for credit.

BIOLOGY 201 - GENERAL BIOLOGY

(3 credits) - lectures and laboratory
Offered in each of the summer, fall & winter semesters, 1996-97

Instructor R. Cronin

Description This survey course introduces the basic principles of biology, the science and of organisms, their structures, functions and associations. Beginning with the basic chemistry of life in the cell, with its organization and control, the course proceeds through cell associations in tissues, organs and systems as found in the higher plants and animals. The biology of organisms as individuals and in populations and communities are also considered, as well as their origins, evolution, distribution and diversity. The laboratory, an essential part of the course, introduces the proper use of the microscope and dissection instruments through the study of prepared slide preparations, as well as preserved and living animal plant material.

Assignments & Grading Students are evaluated on lab assignments, term-test and final examination

Prerequisite None. This course is equivalent to CEGEP BIOL 301.

BIOLOGY 203 - FUNDAMENTAL NUTRITION

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor R. Cronin

Description This course is intended for students not in the Biology programme and deals with the physiological and biochemical role of major nutrients such as protein, carbohydrate and fat as well as that of vitamins and minerals. Sources of, and requirements for, these nutrients will be discussed as well as the concept of energy balance. Modification of nutritional requirements throughout the life cycle (infant nutrition, nutrition for elderly), during athletic training, pregnancy, sickness, weight control programme and vegetarian dietary regimes are considered.

The development of food habits as well as technology of food preparation and preservation are also described. The main objective of the course is to demonstrate why nutrition is important to maintain good health and how to apply it daily for your particular situation.

Assignments & Grading Students are evaluated on a mid-term and final exam plus an essay

Prerequisite None

BIOLOGY 206 - ELEMENTARY GENETICS

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor T.B.A.

Description This course is intended for non-biology students and consists of a survey of classical and molecular genetics, as well as evolution. Some emphasis is placed upon the application of the science to human examples, although the student should expect to learn a considerable amount about other organisms. Sequence of Information: Monohybrid and other organism crosses - multiple alleles - sex linkage - bacterial genetics - population genetics-evolution - recent developments.

The course content changes each year in order to keep up with new developments.

Assignments & Grading The final grade is based upon two examinations and assignments given during the course.

Prerequisite None

BIOLOGY 207 - MICRO-ORGANISMS AND HUMANITY

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor R. Sheinin

Description This course is designed for non-biology students and is intended to provide the student with an elementary understanding of the structure and function of selected viruses, bacteria, protozoa, fungi and algae. The role of these organisms in common human diseases as well as in diseases of agriculturally important plants and animals will be considered. Special problems associated with microorganisms in food production, storage and preservation, will be discussed, in addition to the utilization of microorganisms in the production of pharmaceuticals and vaccines. Industrial uses of micro-organisms, their role in sewage treatment and water pollution will be presented.

Assignments & Grading T.B.A.

Prerequisite None

BIOLOGY 208 - ENVIRONMENTAL BIOLOGY

(3 credits) - lectures only
Offered winter 1996-97

Instructor T.B.A.

Description This course, intended for non-Biology students, considers the various components, living and non-living, of natural areas (ecosystems) and their interactions. The effect of humans on these areas will also be considered. The ways in which environmental factors affect the numbers and distribution of different plants and animals will be studied. We will investigate the flow of the energy necessary to maintain life in ecosystems, the cycling of materials necessary for survival (nutrients), as well as the cycling of toxic substances. Some of the properties of communities of different species will be considered. Factors affecting the growth of populations (including the human population) will be discussed.

Assignments & Grading Mid-term test, term paper and final examination.

Prerequisite None

BIOLOGY 210 - GENETICS AND HUMAN WELFARE

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor T.B.A

Description A course intended for non-Biology students on the principles of heredity as understood by modern biology. It deals also with the application of genetic principles to organisms, including humans. The biological basis of social problems is dealt with at some length. Organic evolution and its implications for human life and welfare are considered.

Assignments & Grading Term test and final examination

Prerequisite None

BIOLOGY 225 - BIOLOGY OF ORGANISMS I (Formerly BIOL 298D)

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor P. Albert and B. Mangat

Description An introduction to plant and animal form and function is presented. This course provides an overview of basic physiological and morphological aspects of plants and animals that allow survival and reproduction. Topics in animal biology include animal architecture, internal fluids, homeostasis, digestion and nutrition, nervous and chemical coordination; topics in plant biology include plant organization, photosynthesis, respiration, water relations, and growth regulation. Reproduction and development of both plants and animals are introduced.

Assignments & Grading Quizzes and final exams

Prerequisite CEGEP Biology 301 or equivalent

Please Note: Students who have received credit for Biology 298D, BIOL 230 or BIOL 240 may not take this course for credit.

BIOLOGY 226 - BIOLOGY OF ORGANISMS II (Formerly BIOL 298E)

(3 credits) - lectures only
Offered fall & winter 1996-97

Instructor J. Grant or E. Maly

Description This course introduces the evolution, biodiversity and ecology of organisms. Lecture topics include an introduction to evolutionary theory and a survey of the five kingdoms of life (Monera, Protista, Plantae, Fungi, Animalia) from an evolutionary perspective. In addition, the course introduces major concepts in ecology: the physical and chemical environment, population structure, life histories, species interactions, communities, and ecosystems.

Assignments & Grading Term test, take home projects and final examination

Prerequisite CEGEP Biology 301 or equivalent

Please Note: Students who have received credit for BIOL 298E or BIOL 250 may not take this course for credit.

BIOLOGY 227 - LABORATORY STUDIES OF ORGANISMS

(3 credits) - laboratory and tutorial
Offered fall & winter 1996-97

Instructor B. Mangat, D. McLaughlin, P. Widden

Description Laboratory exercises are designed to acquaint students with biodiversity and to introduce methodologies common to studies of organisms and populations. This includes field trips, dissections, use of taxonomic keys, and basic exercises in physiological function. Labs will demonstrate use of the microscope, variability within populations, basic techniques in microbiology, and elementary population dynamics. Tutorials include videotapes of plant and animal diversity, natural history, and behaviour.

Assignments & Grading Lab assignments, quizzes, final lab, practical exam and final theory exam.

Prerequisite BIOL 225 (298D) or 226 (298E) previously or concurrently

BIOLOGY 261 - MOLECULAR & GENERAL GENETICS

(3 credits) - lectures and tutorials
Offered fall & winter semesters, 1995-96 & 1996-97

Instructor C. Beckman and P. Gulick

Description This the fundamental principles of inheritance in plants, animals and microorganisms. Mitosis, meiosis, Mendelian genetics, gene linkage, recombination, gene mapping and mutation will be covered. The role of DNA as the hereditary material and genetic code will be studied in detail, as will the mechanisms of DNA, RNA and protein synthesis. There is also an introduction to bacterial genetics and to population genetics.

Assignments & Grading Examinations will test the problem-solving ability of the student with respect to exercises in Mendelian, introductory molecular and population genetics. Regular assignments are required.

Prerequisite CEGEP Biology 301 or equivalent

BIOLOGY 266 - CELL BIOLOGY (FORMERLY BIOL 298C)

(3 credits) - lectures only
Offered winter 1996-97.

Instructor M. Herrington and A. Tsang

Description This course is concerned primarily with the principles by which eukaryotic cells function. Discussions of experimental results will form the basis of understanding these principles. Besides an analysis of the structure and function of various cellular compartments, this course will examine the regulatory mechanisms involved in cell division, cell communication, and cellular responses to changes in the environment. Cellular basis of immune functions and behaviour of cancer cells will be discussed.

Assignments & Grading Lecture tests and final exam on lecture material and assigned reading will be used to determine the final grade.

Prerequisite BIOL 261; CHEM 271 previously or concurrently

Please Note Students who have received credit for this topic as BIOL 298C may not take this course for credit.

BIOLOGY 320 - HISTORY OF BIOLOGY

(3 credits) - lectures only
Not Offered in 1996-97

Instructor T. B. A.

Description This course traces the development of biological thought and discussion from the naturalistic approach of pre- and early historic times to the synthetic approach of modern times. Emphasis will not be on who, what, when, and where, but rather on recognizing the importance of social, religious, economic and political factors that together shaped the scientists and constrained the questions that they asked.

Assignments & Grading There will be several in-class assignments as well as a mid-term and final which are both essay exams.

Prerequisite Any 12 credits in Biology

BIOLOGY 321 - EVOLUTION

(3 credits) - lectures only
Offered summer 1996

Instructor T. B. A.

Description The course will begin by explaining evolutionary principles of macroevolution and continue by examining these principles in light of a particular taxon, the Hominids, of which our species, Homo sapiens, is the sole surviving member. Emphasis will be on the interaction of environment, behaviour, and biology at each of the various stages of human evolution.

Assignments & Grading Grades will be based on a mid-term, final, and several in-class assignments.

Prerequisite Any 12 credits in Biology.

BIOLOGY 322 - BIOSTATISTICS

(3 credits) - lectures and tutorial
Offered fall 1996
Students may replace this course with INTE 298S

Instructor T. B. A.

Description This course explores the application of statistical methods to biological data, and emphasizes the integration of statistical methods and experimental design in hypothesis testing. Materials covered include: basic experimental design; descriptive statistics for central tendency and dispersion; frequency distributions; basic probability theory; statistical inference and hypothesis testing; the normal, Poisson, and binomial distributions; Student's t-test; Analysis of Variance, Correlation and Regression; Chi-square; and non-parametric alternatives for common parametric analyses.

Assignments & Grading Students are evaluated on the basis of mid-term and final exams, assignments and weekly quizzes.

Prerequisite Twelve Biology credits in any Biology Department Major, Specialization or Honours programme me.

BIOLOGY 323 - BIOLOGY OF AGING

(3 credits) - lectures only
Not Offered 1996-97

Instructor T.B.A.

Description In this course we will ask many questions: What are the differences between organisms which age and those which do not? What physiological changes take place in aging? Has there been selection for or against aging in the course of evolution? What are the cellular changes which take place in aging? Does aging change cell division potential?

With this background we will examine what factors may influence lifespan, such as diet, exercise, chemicals. We will examine some of the theories which have been put forward to explain aging, the extent to which molecular repair capability affects aging, and the role of the nervous system, immune system, and endocrine system in aging.

Assignments & Grading Short term-papers are required. Seminars may be required. Mid-term and final examination.

Prerequisite BIOL 261; BIOL 230 or BIOL 225 (298D), 226 (298E)

BIOLOGY 331 - COMPARATIVE VERTEBRATE ANATOMY

(6 credits) - lectures and laboratory
Offered fall & winter 1995-96 and 1996-97

Instructor K.S. Dhindsa

Description A comprehensive study of the anatomy, development and evolution of vertebrate systems, from the lower chordates through the Agnathas, fishes, amphibians and the reptiles to the birds and mammals. Comparative anatomical changes are correlated with the adaptive radiation, evolutionary trends and biological/ecological systems of chordates. The lectures begin with an introduction to the nature, principles, domain of comparative anatomy and vertebrate pedigree. The comparative study of the vertebrate organ systems for the various groups discussed are: integument and its derivatives, supporting tissue and the skeleton, muscles, body cavities, respiratory structures, alimentary systems, excretory and reproductive systems, circulatory systems, sense organs, nervous system, endocrine glands.

The laboratories involve extensive morphological study and general survey of the major groups of chordates. Comparative study of the vertebrate systems through dissections (molgula, lamprey, shark, turtle, pigeon and the cat), series of skeletons, prepared slides, preserved and mounted dissected specimens.

Assignments & Grading Grades are compiled from the results of periodic laboratory and demonstrations plus mid-term and final laboratory and theory examinations.

Prerequisite BIOL 230 or BIOL 225 (298D), 226 (298E), and BIOL 227 previously or concurrently

BIOLOGY 332 - PARASITOLOGY

(3 credits) - lectures and laboratory
Offered fall 1995, fall 1996

Instructor J.D. McLaughlin

Description Parasites cause disease, debilitation and death among humans and animals alike. The importance of parasites in controlling animal populations, in influencing evolutionary processes and on individual behaviour and aspects of mate selection are just now being discovered. This course will examine the phenomenon of parasitism, examine host parasite relationships, pathogenesis, transmission, and control of a variety of parasitic protozons and worms. While the emphasis will be species that infect humans, numerous examples involving livestock and wildlife will also be studied. The course material may be of particular interest to students in pre-professional programmes, ecology and environmentally oriented programme s, agriculture and wildlife.

The laboratory is closely integrated to the lecture material and affords students the opportunity to examine examples covered in class. Emphasis will be on the use of morphological features to identify particular parasites. This involves extensive microscopy. In addition, instruction in some of the basic techniques required to obtain parasites for study and methods for preparing them is provided.

Assignments & Grading The theory mark may be based on a midterm-test (20%) and final exam (50%) or may be based on the final alone (70%). The final theory mark will be calculated both ways and the higher of the 2 marks will be used. A passing mark on the lab final (30%) is necessary to pass the course.

Prerequisite BIOL 230 or BIOL 225 (298D), 226 (298E), 227 previously or concurrently; BIOL 337 recommended

BIOLOGY 334 - VERTEBRATE EMBRYOLOGY

(3 credits) - lecture and laboratory
Offered winter 1996; winter 1997

Instructor R. Cronin

Description An introduction to the description of orderly acquisition of form and structure in developing vertebrates. Topics cover gametogenesis, fertilization, organogenesis, morphogenesis and metamorphosis. A survey of the developmental anatomy of representative vertebrates, using slides and models is conducted in the laboratory.

Assignments & Grading Theory exams, based on essay questions, at mid-term and end of term. There are lab assignments and quizzes and a final laboratory examination. The grading scheme is 60% theory, 40% labs.

Prerequisite BIOL 230 or BIOL 225 (298D), BIOL 226 (298E), and 227 previously or concurrently

BIOLOGY 335 - HISTOLOGY I

(3 credits) - lectures and laboratory
Offered fall 1996

Instructor S.M. Ruby

Description This course consists of a microscopic study of the organization into basic tissue types. The histology of tissues will be examined at the ultrastructural, histo-chemical and physiological levels and these features will be related to the functioning of the various tissue forms. Epithelium, connective tissues, including areolar adipose, reticular, elastic tissue, cartilage and bone, muscle, nervous and vascular connective tissue will be studied in depth and the student will be introduced to the basic concept of organization of tissues into organs and organ systems.

Assignments & Grading Research paper written and laboratory examinations.

Prerequisite BIOL 230 or BIOL 225 (298D)

BIOLOGY 336 - HISTOLOGY II

(3 credits) - lectures and laboratory
Offered winter 1997

Instructor S.M. Ruby

Description This course deals with the organization of the basic tissues into organs and organ systems. It will include the following systems: digestive system and associated glands (liver, pancreas and salivary glands), respiratory, excretory, endocrine, reproductive and haemopoietic systems. The functioning of these systems in relation to these histological structures will be stressed. Wherever possible the comparative aspects of various organs throughout the vertebrates will be examined.

Assignments & Grading Research paper written and laboratory examinations.

Prerequisite BIOL 335

BIOLOGY 337 - INVERTEBRATE ZOOLOGY I

(3 credits) - lectures and laboratory
Offered fall 1995, fall 1996

Instructor J.D. McLaughlin

Description This course examines the structure and biology of the lower invertebrates. Many are important components of reef ecosystems and of interest to marine biologists. Others are important parasites of man, livestock or wildlife. The range of organisms considered includes the protists (single called organisms), the Porifera (sponges), the Cnidaria (hydras, jellyfish, anenomes and corals), the Platyhelminthes (turbellarians, flukes and tapeworms), the Nematoda (roundworms) and time permitting, the Rotifera and/or the Acanthocephala.

The laboratories are closely integrated with the lecture material and provide an opportunity to study the examples used in the lecture component of the course first hand.

Assignments & Grading The theory mark may be based on a midterm-test (20%) and final exam (50%) or may be based on the final alone (70%). The final theory mark will be calculated both ways and the higher of the 2 marks will be used. A passing mark on the lab final (30%) is necessary to pass the course.

Prerequisite BIOL 230 or BIOL 225 (298D), 226 (298E) and BIOL 227

BIOLOGY 338 - INVERTEBRATE ZOOLOGY II

(3 credits) - lectures and laboratory
Offered winter 1996, winter 1997

Instructor J.D. McLaughlin

Description This course examines the structure and biology of the higher invertebrates. Most of the groups studied are marine and are of interest to marine biologists. The range of organisms considered include the Annelida (earthworms, leeches and their relatives), the Mollusca (snails, clams, chitons, squids), the Arthropods (chelicerates, crustaceans, and some insects) and the Echinodermata (starfish, sea urchins and their relatives). Lectures will stress biology, physiology and ecology of selected examples.

The laboratory is closely integrated with the lecture material and provides an opportunity to examine the anatomy and comparative morphology of examples studied in class. This is accomplished first by dissection of a representative of each group and subsequent comparison of that specimen with related organism.

Assignments & Grading The theory mark may be based on a midterm-test (20%) and final exam (50%) or may be based on the final alone (70%). The final theory mark will be calculated both ways and the higher of the 2 marks will be used. A passing mark on the lab final (30%) is necessary to pass the course.

Prerequisite BIOL 225 (298D), 226 (298E) and 227.

BIOLOGY 344 - BIOLOGY OF ALGAE

(3 credits) - lectures and laboratory
Not Offered 1996-97

Instructor T. B. A.

Description A study of the morphological, physiological, and ecological diversity in algae with emphasis on the distinguishing characteristics of each major group. Topics include the commercial and industrial uses of algae, the use of algae as pollution indicators and the influence of algae on the environment. Laboratories are designed to enable the student to collect, identify and quantify algae specimens from fresh water ecosystems. The physiology of representative cultured algae will also be examined.

Assignments & Grading Lab reports and projects; mid-term examination; final exam

Prerequisite BIOL 240 or BIOL 225 (298D), 226 (298E), and BIOL 227 previously or concurrently

BIOLOGY 346 - PHYSIOLOGY OF PLANT DEVELOPMENT

(3 credits) - lectures and laboratory
Offered winter 1997

Instructor B.S. Mangat

Description The course deals with the physiological and biochemical aspects of plant growth and development. The biochemistry and the role of phytohormones in plant growth and development are discussed. Topics also include the response of plants to light and temperature, seed germination and dormancy. Laboratory exercises are based on some of the topics discussed in the lectures.

Assignments & Grading Mid-term test, laboratory reports, quizzes and final examination.

Prerequisite BIOL 240 or BIOL 225 (298D), 226 (298E), and BIOL 227 previously or concurrently

BIOLOGY 349 - PLANT NUTRITION AND METABOLISM

(3 credits) - lectures and laboratory
Offered fall 1996

Instructor B. Mangat

Description A study of the physiological processes of higher plants relating to water relation, mineral nutrition, photosynthesis, carbohydrate and nitrogen metabolism. These processes are discussed in relation to the environmental factors which govern them.

Assignments & Grading Quizzes, mid-term, laboratory and final exam

Prerequisite BIOL 240 or BIOL 225 (298D), 226 (298E), and BIOL 227 previously or concurrently.

BIOLOGY 352 - PLANT FIELD ECOLOGY

(3 credits) - Field course
Offered summer 1996

Instructor P. Widden

Description This course is normally offered during the last two weeks of August at the Lacolle Centre. Students are expected to live at the centre for the entire 2-week period. The course will involve the identification of local plant species and the collection and preservation of specimens. The use of relevée analysis, quadrant sampling, line and belt transects and vegetation mapping methods in describing plant communities will be demonstrated. The application of statistical methods to quantitative data on species populations will also be discussed. The course will consist of formal lectures, informal discussion groups, organised field work, individual projects, and an excursion into the Adirondacks to look at plant communities in the mountains.

Assignments Grading Grading will be based on a written report and a pressed plant collection, that will & be handed in one month after the completion of the field work.

Prerequisite BIOL 240 or BIOL 225 (298D), 250 or 226 (298E), 227 and 322

Campus Lacolle Centre

Please note: This course is given during the 2 weeks preceding the start of Fall Semester. Students must register for Summer Session.

BIOLOGY 355 - FUNDAMENTALS OF LIMNOLOGY

(3 credits) - lectures only
Not Offered 1996-97

Instructor T.B.A.

Description An introduction to the study of inland water ecosystems with an emphasis on the physical, chemical, and biological features of lakes. Topics include formation and type of lake basins, optical and thermal properties of lakes, distribution and cycling of major nutrients, a description of the major taxa inhibiting lake ecosystems and the factors affecting community structure in lakes. Other topics will include the features of specialized lakes (e.g. inland saline lakes), pollutants, and eutrophication. The course will consist of lectures and informal discussion.

Assignments & Grading Evaluation is based upon a mid-term exam, a final exam, and written assignments.

Prerequisite BIOL 250 or BIOL 225 (298D), 226 (298E)

BIOLOGY 356 - MICROBIAL ECOLOGY

(3 credits) - lectures and laboratories
Offered winter 1997

Instructor P. Widden

Description The course is designed to give an understanding of the environments in which microbes live, the structure and organization of microbial communities and the interactions between different groups of microorganisms. Topics discussed will include the structure of soils, water relations, nutrient supply, the role of microorganisms in the degradation of organic substances, nutrient cycling, microbial symbioses, parasitism and predation, microbial succession and the relative contributions of different taxonomic groups to the decomposition process. The major stress will be on terrestrial organisms, but some time will be devoted to the discussion of aquatic systems. The course will consist of lectures, student seminars, informal discussion and an integrated laboratory project.

Assignments & Grading Grading is based on formal laboratory reports, a mid-term and final theory examination.

Prerequisite BIOL 250, 270 or BIOL 225 (298D), 226 (298E), 227

BIOLOGY 358 - INTRODUCTION TO ANIMAL BEHAVIOUR

(3 credits) - lectures and tutorials
Offered winter 1997

Instructor L.-A. Giraldeau

Description An introduction to behaviour with emphasis on the proximate causes of behaviour as well as its evolutionary significance. Topics will include perception, learning, communication, homing, development, genetics, innate motor patterns and behaviour cycles.

Assignments & Grading Mid-term and final examination plus, participation in tutorials and term papers.

Prerequisite BIOL 250 or BIOL 225 (298D), 226 (298E)

BIOLOGY 359 - EVOLUTIONARY ECOLOGY

(3 credits) - lectures only
Not Offered 1996-97

Instructor D. Fairbairn

Description This course covers current topics in evolutionary ecology. The aim of the course is to provide students with the knowledge and ability to understand and critically evaluate evolutionary hypotheses in ecology and behaviour. Mechanisms of adequately testing such hypotheses are also considered.

The emphasis is on case studies of topics of current interest, and therefore the course content may vary from year to year. We begin with a formal review of the meaning and mechanisms of natural selection and evolution. We briefly consider issues such as genetic versus non-genetic variability, the efficiency of selection, and the unit of selection. This introductory section is followed by case studies which analyze the adaptive significance and evolution of various ecological traits and processes. In this section we discuss the evolution and adaptive significance of traits such as mimicry, tolerance to pollutants, senescence, body size, sex ratio, sexual reproduction, sexual size ratio, age at first reproduction and reproductive effort.

Assignments & Grading Students are evaluated on the basis of mid-term and final exams plus one essay.

Prerequisite BIOL 261; BIOL 250 or BIOL 225 (298D), 226 (298E)

BIOLOGY 363 - CYTOGENETICS (Formerly Biology 467)

(3 credits) - lectures only
Not offered 1996-97 T.B.A.

Instructor T.B.A.

Description This course is designed to complement courses in cell and molecular biology and genetics, and is a concentrated examination of chromosomes, both plant and animal, as to their structures, numbers and behaviour, whether normal or abnormal, as well as their roles in species maintenance and diversification. Topics will include: mechanisms of genetic exchange, gene amplification, gene mapping, gene targeting and oncogene action, somatic cell genetics, polytene chromosomes, polyploid adaptations and karyotype analysis in relation to evolution.

Assignments & Grading Final mark is based upon term paper, mid-term and final exam.

Prerequisite BIOL 261; BIOL 266 (298C)

Please Note: Students who have completed BIOL 467 may not take this course for credit.

BIOLOGY 364 - CELL PHYSIOLOGY

(3 credits) - lectures only
Offered fall 1996

Instructor J. Kornblatt and R. Roy

Description A course in which cellular function and cellular response to the environment are surveyed. The course concentrates on: i. assembly of biological structures; ii. biological membranes, their structure and permeability properties; iii. transport across biological membranes; iv. membrane potentials and nerve function; v. motility: muscle, cilia and flagella; vi. biological energy production: mitochondrial oxidative phosphorylation, chloroplast-photophosphorylation, bacterial systems, the proton pumps of all cells; vii. response to stress (temperature and pressure).

Assignments & Grading Mid-term tests and final exam.

Prerequisite BIOL 266 (298C)

BIOLOGY 366 - MECHANISMS OF DEVELOPMENT

(3 credits) - lectures only
Offered fall 1996

Instructor A. Tsang

Description In this course, our objective is to gain an understanding of the mechanisms controlling the differentiation of cells and the development of organisms. We will consider cell interactions and molecular events in development. Embryonic induction, cell sorting, tissue assembly, control of cell growth, and gene control of cell differentiation will be examined.

We will further explore, as time permits, the biological basis of cancer cell differentiation, of metamorphosis and of regeneration. Transgenic influences on development, growth control, cell growth factors and chemical morphogens may be examined.

Assignments & Grading Short term papers are required. Seminar presentations may be required.

Prerequisite BIOL 261, BIOL 230 or 225 (298D), 226 (298E), 227

BIOLOGY 367 - MOLECULAR BIOLOGY

(3 credits) - lectures and tutorials
Offered winter 1996

Instructor R. Storms and M. Herrington

Description This course is designed to provide students with a thorough background in molecular genetics. The topics covered include an examination of the structure and replication of DNA, chromosome organization, the molecular mechanisms underlying the recombination of DNA, the molecular basis of gene regulation, and how gene expression is tied to intracellular and extracellular factors by signal transduction pathways. The course will conclude by applying an understanding of these topics to an assessment of how oncogenes cause cancer. In an attempt to provide students with an appreciation of the experimental approaches used to do research in molecular biology, several important experiments and the methodologies used to perform them, will be covered. This will introduce students to recombinant DNA methodologies such as gene cloning, DNA sequencing and in vitro mutagenesis.

Assignments & Grading Final grades will be based on a combination of term papers and examinations covering lecture material and assigned readings.

Prerequisite BIOL 261 and CHEM 271

Please Note Students who have received credit for Biol. 398B may not take this course for credit.

BIOLOGY 368 - GENETICS AND CELL BIOLOGY LABORATORY

(3 credits) - laboratory and tutorials
Offered fall & winter 1996-97

Instructor M.B. Herrington and R.M. Roy

Description Introduction to the basic laboratory techniques of genetics, molecular biology and cell biology. Experiments will include the isolation, mapping and characterization of bacterial mutants; isolation and restriction mapping of a plasmid from a transformed strain of Escherichia coli; physiological studies on cell membrane function; and an examination of mitochondrial and photosynthetic electron transport. The tutorial period will be used to present theoretical and practical information about the experiments and to discuss results. Regular attendance at both laboratory and tutorials is required. The final grade will be determined as follows:

Assignments & Grading

25% Participation (attendance, completion of experiments, verbal or written reports of data to demonstrators, cleaning up after completing experiments)

20% Quizzes (scheduled during the tutorial period)

55% Final examination (a 3-hour examination scheduled in the regular examination period)

Prerequisite CHEM 212 or 217; BIOL 364 previously or concurrently.

BIOLOGY 370 - MICROBIOLOGY

(3 credits) - lectures only
Offered fall 1996

Instructor T. B. A.

Description This course considers the life of bacteria of all sorts, and occasional viruses and fungi as well as the niches in which they live, how they 'earn their living' their impact on the environment and the amazing uses to which they are put by humans since antiquity, and in the age of genetic engineering. Aspects of microbial genetics, biochemistry, physiology and structure will be considered. Effects of microorganisms on their hosts (i.e., disease) will also be discussed.

Assignments & Grading 40% final exam; 40% term paper; 20% critique of papers of other students, and class discussion.

Prerequisite BIOL 226, 261 and CHEM 271

Please note All students are expected to have a computer account and to learn how to use computers for reading the Biology 370 bulletin board. Class notes and inter-student discussions will take place through this computer bulletin board.

BIOLOGY 380 - NUTRITION

(3 credits) - lectures only
Offered winter 1997

Instructors T. B. A.

Description This course provides an introduction to the science of nutrition through the study of the metabolism, utilization, and functions of all essential nutrients: proteins, lipids, carbohydrates, vitamins, minerals, fiber and water. Nutritional needs throughout the life cycle are studied and some of the methods available to evaluate the nutritional status of individuals are reviewed. The influence of environmental factors on nutrient intake is discussed, and the consequences of dietary deficiencies are examined.

Assignments & Grading Mid-term and/or essay and final exam

Prerequisite CHEM 222; CHEM 271 recommended

BIOLOGY 381 - BIOLOGY OF POLLUTANTS

(3 credits) lectures only
Not Offered 1996-97

Instructor T.B.A.

Description The purpose of this course is to study the impact of pollution on ecosystems. The major classes of pollutants are considered in relation to their nature, origin and distribution, and particularly their mode of action on individual organisms and ecosystems. Air, water and soil are examined with their respective pollutants and major emphasis is given to quantitative assessments of various agents and their effects. The course also includes theoretical and practical aspects of bioassays and an overview of case studies and of control measures.

Assignments & Grading T.B.A.

Prerequisite BIOL 250 or BIOL 225 (298D), 226 (298E)

BIOLOGY 383 - ANIMAL PHYSIOLOGY I

(Formerly first half of Biology 333)
(3 credits) - lectures and laboratory
Offered fall 1996

Instructor N. Kapoor

Description A study of basic cellular and physiological mechanisms in vertebrates. Topics discussed include regulation of animal internal environment, neuromuscular physiology, sensory mechanisms and control of body movements.

The laboratories are designed to develop a student's awareness of quantitative approaches in physiology and to introduce students to some simple surgical techniques and basic instrumentation. Various laboratory exercises, demonstrations and projects relate to system physiology in animals. Students are encouraged to gain information from various sources. Some laboratories may include student's participation in seminars.

Assignments & Grading Laboratories are important and form an integral part of the course. A good lab report is expected. Laboratory assignments may also include seminars. Examination question papers include material covered in lectures, assigned readings and laboratories. Examination format may be either multiple choice, short answers, essay-type or a combination thereof. Grades are based on lab reports mid-term and final examination.

Prerequisite BIOL 230, CHEM 271; or BIOL 225 (298D); CHEM 271

Note: Students who have received credit for BIOL 333 may not take this course for credit.

BIOLOGY 384 - ANIMAL PHYSIOLOGY II

(Formerly second half of Biology 333)
(3 credits) - lectures and laboratory
Offered winter 1997

Instructor N. Kapoor

Description This course is a continuation of BIOL 383 and includes the study of mechanisms by which activities of major organ systems are coordinated and regulated in vertebrates, especially humans. Topics covered include blood, cardiovascular systems, respiration, water-electrolyte regulation, digestion, and metabolism.

The laboratories are designed to develop a student's awareness of quantitative approaches in physiology and to introduce students to some simple surgical techniques and basic instrumentation. Various laboratory exercises, demonstrations and projects relate to system physiology in animals. Students are encouraged to gain information from various sources. Some laboratories may include student's participation in seminars.

Assignments & Grading Laboratories are important and form an integral part of the course. A good lab report is expected. Laboratory assignments may also include seminars. Examination question papers include material covered in lectures, assigned readings and laboratories. Examination format may be either multiple choice, short answers, essay type or a combination thereof. Grades are based on lab reports mid-term and final examination.

Prerequisite BIOL 383

Note: Students who have received credit for BIOL 333 may not take this course for credit.

BIOLOGY 385 - ENTOMOLOGY I

(3 credits) - lectures and laboratory
Not Offered 1996-97

Instructor P.J. Albert

Description An introduction to the study of insects. Basic classification, structure/function and physiology. Topics will be discussed as follows:

Introduction: Classification: Protura, Thysaneura, Diplura, Collembola, Embioptera, Plecoptera, Psocoptera, Dermaptera, Ephemeroptera, Orthoptera, Zoraptera, Mallophaga, Anoplura, Thysanoptera, Hemiptera, Homoptera, Coleoptera, Strepsiptera, Mecoptera, Neuroptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, Hymenoptera.

Morphology: Outer covering, cuticle, external processes of body wall segmentation. Insect head, types, antennae, mouthparts and modifications. Thorax, legs, wings, locomotion. Abdomen, reproductive appendages. Insect metamorphosis - types.

Anatomy: Alimentary canal, excretory and circulatory systems, reproductive and central nervous systems, sensory systems.

Laboratory sessions will deal with morphology, anatomy and classification. Each student will hand in a collection of 50 different insect species, identified and labelled. Students are advised to begin an insect collection during the summer months. Collect insects in small jars with label for date and location, and store in freezer until required in course.

Assignments & Grading Insect Collections (50 different insects, classified)
Midterm-Exam (optional); Lab Exam (Compulsory) Final Exam (Compulsory)

Prerequisite BIOL 230 or BIOL 225 (298D), BIOL 226 (298E) and BIOL 227

BIOLOGY 386 - ENTOMOLOGY II

(3 credits) - lectures and laboratory
Not Offered 1996-97

Instructor P.J. Albert

Description This course deals with insect physiology and behaviour. It emphasizes the relationships between structure and function of various insect parts. The lecture topics will include the following: Introduction to insect behaviour, vision, gustation, olfaction, pheromones, hormones, light production, sound production and perception, social behaviour, diapause, migration, and insect control.

Assignments & Grading The final grade will be a combination of marks from the following: midterm test, term-paper & final exam. The values for each of these will be determined at the first lecture.

Prerequisite BIOL 232 (BIOL 232 or 385 after 1994-95)

Please Note: Students who have taken BIOL 398D may not take this course for credit.

BIOLOGY 398A - INTERMEDIATE TOPICS IN BIOLOGY

Subject - Intermediate Concepts in Ecology
(3 credits) - lectures
Offered fall 1996

Instructor T. B. A.

Description This course discusses adaptation (in the broadest sense) to the environment: biotic and abiotic. Major topics include response of organisms to temperature, water, oxygen, light and interspecific interactions. Physiological mechanisms will be emphasized.

Assignments & Grading Term paper, mid-term and final examinations.

Prerequisite BIOL 250 or 226 (298E)

Please Note Students who have taken Biology 353 (Intermediate Ecology) may not take this course for credit.

BIOLOGY 398C - INTERMEDIATE TOPICS IN BIOLOGY

Subject - Plant Interactions with Other Organisms
(3 credits) - lectures only
Not Offered 1996-97

Instructor T.B.A.

Description Unlike animals which possess an elaborate immune system and have the ability to escape their predators, plants produce a variety of specific signals, signal reception mechanisms and stress response systems that allow them to interact with other plants, pathogenic and symbiotic organisms, insects and larger herbivores, as well as humans. These complex interactions are discussed with particular emphasis on the role of plant signals in the adaptation and co-evolution of organisms, as well as their protection against predators. Lectures and discussions.

Assignments & Grading T.B.A.

Prerequisite BIOL 240, BIOL 250; or BIOL 225 (298D), BIOL 226 (298E); and CHEM 221 previously or concurrently

BIOLOGY 398E - INTERMEDIATE TOPICS IN BIOLOGY

Subject - Basic Population Ecology
(3 credits) - lectures only

Instructor E. Maly

Description This course introduces the processes which determine the distribution and abundance of individuals in populations. Population growth, density-dependent and density-independent, population regulation, survivorship, life history, parameters, the population dynamics of competition, predation and parasitism and the roles of predation and competition in affecting community structure are discussed.

Assignments & Grading Two mid-term exams, final exam and take-home assignments.

Prerequisite BIOL 226

BIOLOGY 420 - RADIATION BIOLOGY AND RADIOTRACER METHODOLOGY

(3 credits) - lectures and laboratory
Not offered 1996-97

Instructor R.M. Roy

Description This course attempts to provide students in the biological sciences with a basic understanding of the properties of ionizing radiation and its interaction with matter. The production and characteristics of X-rays and techniques of detecting radiation or measuring radiation dose are discussed in detail. The theoretical background and the practical techniques of utilizing the following detectors are presented: geiger counter, gas-flow proportional counter, solid and liquid scintillation counter. The procedures for handling radioisotopes and labelled compounds are discussed.

The effects of ionizing radiation on water and free radical production will be considered. The biological effects of ionizing radiation at the biochemical, cellular, organismal and ecological level will be discussed in detail. Special emphasis will be given to DNA damage, repair processes, cell survival, immune responses, mutagenesis and carcinogenesis.

Laboratories will illustrate the properties of ionizing radiation, operation of X-ray equipment, measurement of radiation dose, operation of various types of counters, and the biochemical and physiological responses of mammalian cell to radiation.

Assignments & Grading Grades are largely based on lab reports (50%) and an essay-type final exam (40%); 10% of the final grade is based on lab and lecture participation.

Prerequisite BIOL 364, 367

BIOLOGY 431 - BIOLOGY OF FISHES

(3 credits) - lectures and laboratories
Not Offered 1996-97

Instructor J. Grant

Description A broad introduction to the biology of fishes emphasizing their unique adaptations as aquatic organisms. Lecture topics include systematics, evolution, anatomy, physiology, behaviour, ecology and fisheries management.

Laboratory work includes two, one-day field trips (possibly on weekends) to sample fish communities in local streams, dissecting representative specimens of fishes, keying and identifying local freshwater species, and a visit to the Montreal Biodome.

Assignments & Grading There will be laboratory quizzes in addition to a mid-term and final exam. Students will present a seminar on a current topic in fish biology and will write a term paper based on data collected by the class during field trips.

Prerequisite BIOL 230, 250; or BIOL 225 (298D), 226 (298E), 227

BIOLOGY 432 - COMPARATIVE AND ENVIRONMENTAL PHYSIOLOGY

(3 credits) - lectures only
Not offered 1996-97

Instructor N. Kapoor

Description The primary theme of this course is the physiological interrelationships between animals, and their environments. A comparative study of selected physiological processes in diverse phyla, dealing with behavioural and physiological adaptations in animals. Lectures and seminars.

Assignments & Grading T.B.A.

Prerequisite BIOL 333 or BIOL 383, 384

BIOLOGY 441 - PLANT BIOCHEMISTRY

(3 credits) - lectures only
Not Offered 1996-97

Instructor R.K. Ibrahim

Description A lecture course dealing with the biochemistry of natural products unique to plants, such as cell wall components, alkaloids, phenolics, flavonoids and terpenoids, to mention only a few. Although these compounds play no important role in the cellular economy of plants, they seem to be indispensable for the survival of species, being formed in response to environmental stresses, fungal attack or insect infestation.

The course starts with a review of the metabolic activities of plant cells and the role of intermediates in the biosynthesis of natural plant products. Emphasis is placed on the biological activities of these metabolites, their role in plant interactions with other organisms, and their potential use in plant biotechnology.

Assignments & Grading Mid-term assignments and final examination.

Prerequisite CHEM 271

BIOLOGY 442 - PERSPECTIVES IN PLANT TISSUE CULTURE AND PLANT BIOTECHNOLOGY

(3 credits) - lectures and seminars
Not offered 1996-97

Instructor Dr. B.S. Mangat

Description This course will explore the various aspects of plant cell and tissue culture, culture tools and techniques. The course will also discuss the biotechnological methods being employed for plant improvement, the transformation of plants by somatic and gametosomatic hybridization and the use of *Agrobacterium* and other vectors for nuclear material transfers.

Assignments & Grading Student's performance is evaluated on the basis of a term paper, seminars, mid-term and a final examination.

Prerequisite BIOL 346 or permission of the instructor

BIOLOGY 452 - ECOLOGICAL GENETICS

(3 credits) - lecture and tutorials
Not Offered 1996-97

Instructor D. Fairbairn

Description This course explores the interface between population ecology, population genetics, and evolution. Topics covered include: methods of detecting genetic variation in natural populations; patterns of genetic variation in natural populations; adaptation, fitness and selection; migration and gene flow; mutation; quantitative inheritance; population structure; maintenance of genetic variation in natural populations; classical, balance, and neo-classical theories; and methods of measuring natural and sexual selection in natural populations.

Assignments & Grading Students are evaluated on the basis of mid-term and final exams, plus seminar presentations.

Prerequisites BIOL 322 and 359 or permission of the instructor

BIOLOGY 453 - BEHAVIOURAL ECOLOGY AND SOCIOBIOLOGY

(3 credits) - lectures and tutorials
Offered winter 1997

Instructor Luc-Alain Giraldeau

Description A survey of the ecological aspects of behaviour and the underlying biological basis of social behaviour in both vertebrates and invertebrates. Topics include simple optimality and evolutionarily stable strategies, foraging theory, territoriality, aggression, mate selection, mating systems, parental care, altruistic behaviour, kin selection and group selection.

Assignments & Grading Mid-terms and final examination, participation in tutorials and tutorials and possibly a term paper.

Prerequisite BIOL 358

BIOLOGY 454 - POPULATION ECOLOGY

(3 credits) - lectures only
Not offered 1996-97
Students are referred to BIOL 398E

Instructor E. Maly

Description A theoretical approach to ecological problems. This is an advanced course designed to acquaint students with ecological studies that contain a large element of theory. Topics may vary in different years but will include most of the following: evolutionary aspects of ecological problems, population dynamics, species diversity, stability of ecosystems, regulation of population size, resource partitioning (competition and its avoidance) predation, biogeography, and dispersal.

Assignments & Grading Reading assignments will be from original literature and from a textbook. Students may be assigned problems, and it is expected that students will have some working knowledge of CEGEP level calculus courses. Grading is on the basis of assignments mid-term and final exams and on class participation.

Prerequisite 6 credits from BIOL 352, 355, 356, 357, 358, 359, 398A, and 453

456 CURRENT ADVANCES IN ECOLOGICAL RESEARCH

(3 credits) - lectures and seminars
Not Offered 1996-97

Instructor D. Fairbairn

Description This course aims to familiarize advanced undergraduate students with all aspects of research in modern ecology, and to teach them to critically evaluate the literature. Evaluations are made both orally and as written critiques, and students learn to address issues of experimental design, statistical analysis, clarity of hypotheses, as well as completeness, clarity, and appropriateness of conclusions. Topics may include studies in evolutionary, behavioral, population, community, systems and conservation ecology. During the first half of the course, we review a recent book on a controversial topic. The review takes the form of chapter by chapter seminars presented by students, followed by class discussion. During the second half of the course, students review papers from the recent literature (past 5 years) and present these to the class in the form of seminars. Papers are chosen in consultation with the instructor. In addition to oral presentation, students must prepare written critiques and insightful, written questions concerning the papers and book chapters presented.

Assignments The final grade is based on oral presentations, written critiques, and weekly, written questions. Generally, each student prepares 3 oral presentations, 3 critiques and a minimum of 12 written questions. There are no exams.

Prerequisites BIOL 322 or equivalent, plus a minimum of 3 credits from BIOL 352, 355, 356, 357, 358, 359, 398A, 454. Third year standing is recommended.

BIOLOGY 461 - ADVANCED GENETICS

(3 credits) - lectures and seminars
Offered winter 1997

Instructor C. Beckman

Description This course is a seminar course in which the students do most of the lecturing. It is in no sense required, but may be of interest to those who wish to gain experience in computerized searches of literature in data bases on the internet, use of computerized library catalogues and experience in speaking to a class. Each year a topic is chosen. Students do two verbal presentations, one to aid the class in obtaining a common background for the topic and a second one on a specific topic. In addition a short term paper is required, and there is a take home final.

The oral work is required and no substitution of written work for the oral portion will be allowed, hence students should have sufficient oral skills so that they can be understood by the class. The current topic is, " Recent Advances in Human Genetics".

Assignments & Grading Grades will be based on take-home exams and the student's presentation.

Prerequisite BIOL 261

BIOLOGY 462 - IMMUNOLOGY

(3 credits) - lectures and conferences
Offered fall 1996

Instructor J.A. Kornblatt

Description A course in modern immunology stressing the following areas of study: the structure and properties of antigens and antibodies; the nature of the immune response: B-cell responses, T-cell responses; genetic aspects of the immune system; theories relating antibody specificity to genetic potential.

Assignments & Grading Weekly quizzes, optional final

Prerequisite BIOL 364

BIOLOGY 464 - ADVANCED CELL PHYSIOLOGY

(3 credits) - lectures only
Offered winter 1997

Instructor T.B.A.

Description In this course an attempt is made to discuss current topics in cell biology and biochemistry. Methods of in vitro culture of mammalian cells are presented. Other subjects covered include detailed discussions of: the biochemistry of the cell cycle, the cell surface, factors involved in the control of cell replication in normal and tumour cells, mechanisms of peptide and steroid hormone action, second messenger generation, cell hybridization techniques and their applications in the study of the control of gene expression.

Assignments & Grading Essay and final examination.

Prerequisite BIOL 364

BIOLOGY 465 - BIOLOGICAL REGULATORY MECHANISMS

(3 credits) - lectures and conferences
Offered fall 1996

Instructor E.B. Newman

Description This course deals with the molecular aspects of how procaryotes regulate their metabolism and respond to their environment. It will focus on the general regulators of procaryote transcription, with a special concentration on cyclic AMP/ CRP in its many manifestations in the bacterial cell.

The emphasis in this course is on the logic of scientific experimentation. Where do our concepts come from? What sorts of evidence do we rely on? What experiments give us what sort of evidence?

Assignments & Grading This course is graded on a final exam and a midterm, together 50-70% and on 2 term papers 30-50%. Term papers consist of an analysis of a paper from the current literature, and a survey of related topics. The detailed grading system will be explained at the first class.

Prerequisite BIOL 261; CHEM 271; or permission of the instructor

BIOLOGY 466 - ADVANCED LABORATORY IN MOLECULAR BIOLOGY

(3 credits) - laboratory and tutorials
Offered fall & winter 1996-97

Instructor L. Varin or M. Herrington

Description This course deals with the theory and practice of modern experimental procedures of molecular biology, including use of restriction enzymes, gene cloning, hydridizations, DNA sequencing, site-directed mutagenesis, and the use of bacteria and phage in biotechnololgy.

Assignment & Grading Lab reports, term paper, lab exam

Prerequisite BIOL 368

Note Students who have received credit for CHEM 479 may not take this course for credit.

BIOLOGY 468 - GENE STRUCTURE

(3 credit) - lectures only
Not Offered 1996-97

Instructor R. Storms

Description This course deals with gene regulation in eukaryotes. Topics covered will include transcription, transcript processing, translation, and posttranslational processes.

Assignments & Grading Final grades will be based on a combination of term papers and examinations covering lecture material and assigned readings.

Prerequisite BIOL 367 (398B)

Please Note: Students who have received credit for BIOL 498D may not take this course for credit.

BIOLOGY 469 - DNA REPAIR

(3 credits) - lecture only
Offered winter 1997

Instructor T.B.A.

Description The course will cover a series of topics concerned with chemical alterations to replicating and non-replicating DNA arising spontaneously, or as a result of exposure to exogenous mutagens. Mechanisms of enzymatic repair of DNA damage in procaryotes and eucaryotes will be considered, with emphasis on the experimental approaches which have led to our current knowledge. The role of defective DNA repair in human diseases will also be examined. Lecture and exam material will be drawn from recent scientific papers. Lectures only.

Assignments & Grading 1 term paper, 1 oral presentation, 1 open-book final exam

Prerequisite BIOL 367

Please Note: Students who have received credit for BIOL 498I may not take this course for credit.

BIOLOGY 470 - MICROBIAL PHYSIOLOGY

(3 credits) - lectures only
Not Offered 1996-97

Instructor T. B. A.

Description A survey of the diverse ways in which microorganisms derive energy and build cell constituents. How does an organism like Thiobacillus thiooxidans survive at pH 1 and derive energy from oxidizing sulfur? Is its metabolism fundamentally different from that of E. coli which lives in an animal intestine at 37°C, from B. stearothemophilus which carries out its metabolic affairs at 55°C, or from a methane bacterium that won't grow at all if any oxygen is present?

The course surveys the biochemistry of energy-yielding reactions, compares pathways in similar and diverse organisms, and considers metabolic balance sheets. In addition, an attempt is made to understand the ecological niche of organisms in terms of their biochemistry i.e., in what ways are organisms diverse. On the other hand, an attempt is made to derive some general principles of the biochemical requirements for microbial life by finding the similarities in diverse organisms.

Assignments & Grading To be arranged with participants in the course.

Prerequisite BIOL 225 (298D), 226 (298E) and CHEM 271 or permission of the instructor.

BIOLOGY 490 - INDEPENDENT STUDY

(6 credits)
Offered Summer-fall 1996; fall-winter 1996-97

Instructor Faculty

Description This programme provides an opportunity for 3rd year students to conduct independent laboratory and literature research on a topic of special interest. This course is particularly suited for students who are considering a career in research, for it tests one's ability to think creatively and critically, to appreciate and develop concepts, to acquire in-depth knowledge, to analyze and solve problems, and to conduct laboratory projects in Biology with skill.

Assignments The projects will be graded on the basis of the work done, the written thesis and the oral defense of the thesis. Because students must obtain an agreement from a Biology professor to supervise their projects, they are advised to make these arrangements and notify the programme 's co-ordinator at the end of their 4th semester of study.

Prerequisite 3rd Year Honours Programme me. Students with high academic standing in 3rd year Biology Specialization programme me may be granted permission to take this course.

Please note: Students must obtain permission of Dr. J.D. McLaughlin (BIOL 490 Coordinator) to register for this course. Students register for BIOL 490/2 if work started in winter or summer semesters.

BIOLOGY 498A - ADVANCED TOPICS IN BIOLOGY

Subject - Biochemistry and Genetics of Disease
(3 credits) - lectures only
Offered winter 1997

Instructor Full-time faculty and guest lecturers

Description This course will cover recent advances in our understanding of the genetics, molecular biology and biochemistry of disease. Topics covered may include: biochemical basis of bacterial diseases; identification of genes, and the resulting biochemical defects, responsible for specific diseases; enzyme inhibitors as drugs; gene therapy; prenatal diagnosis, detection of carriers; mechanisms of drug resistance in bacteria and viruses; emergence of new pathogens, etc.

Assignments & Grading T.B.A.

Prerequisites CHEM 271; CHEM 374 or BIOL 367 (398B)

BIOLOGY 498B - ADVANCED TOPICS IN BIOLOGY

Subject - Plant Responses to Stress
(3 credits) lectures only
Offered winter 1997

Instructor

Description This course deals with the biochemical and physiological responses as well as ecological adaptations of plants to environmental abiotic and biotic stresses. These include the tolerance of plants to cold, drought, high salinity and xenobiotics, as well as the effects of ultraviolet and ionizing radiation on plant processes. In addition, the interaction of plant chemicals, as signalling molecules, with insects, other herbivores and soil micro-organisms will be emphasized. Examples will be chosen to highlight genetic engineering strategies for improving plant productivity and tolerance to stresses.

Prerequisites BIOL 240 or BIOL 225 (298D), CHEM 271 and a minimum of 3 credits from the following: BIOL 349, BIOL 364, BIOL 367, BIOL 498X or CHEM 375 previously or concurrently

BIOLOGY 498D - ADVANCED TOPICS IN BIOLOGY

Subject - Virology
(3 credits) - lecture only
Offered fall 1996

Instructor T.B.A.

Description This course will be divided into two parts. Part 1 will consist of a series of lectures discussing the life cycles of different families of animal virus. Emphasis will be on specific viruses known to cause pathogenesis in birds or mammals, and there will be in-depth coverage of retroviruses and their relationship to cancer and AIDS. Part 2 of the course will consist of student presentations on selected topics in animal virology.

Assignment & Grading Final exam and student presentation

Prerequisites BIOL 266, BIOL 367

BIOLOGY 498V - ADVANCED TOPICS IN BIOLOGY

Subject - Mechanisms of Protein Synthesis
(3 credits) - lecture only
Offered fall 1996

Instructor M. Herrington

Description The translation of the nucleotide sequence of a messenger RNA into the amino acid sequence of a protein involves over one hundred different proteins and RNA molecules. We will examine current research on the role of these molecules in translation. This will involve both in vivo approaches and in vitro approaches. Specific topics may include how aminoacyl tRNA synthetases recognize the appropriate tRNA, how the ribosome slips or hops while decoding mRNA, and the role of ribosomal RNA. Readings will be selected from the current literature.

Assignments & Grading The final grade will be based on examinations, assignments and class participation.

Prerequisites BIOL 367, CHEM 375

498X - ADVANCED TOPICS IN BIOLOGY
Subject - Plant Molecular Genetics
(3 credits) - lecture only
Offered fall 1997

Instructor P. Gulick

Description This course will survey topics in the rapidly developing field of plant molecular genetics and plant biotechnology. Many innovative applications of the modern methods of genetic engineering are being applied to the investigation of plant biology and to crop improvement. This course will discuss the analysis of genome structure, mRNA population complexity, gene cloning strategies, gene transfer in plants, transposable elements, restriction fragment length polymorphism (RFLP), and molecular analysis of host parasite interaction.

Assignments & Grading Grading is based on three take-home exams (60%), one mid-term exam in class (20%) and one assignment in which the student can choose to write term paper or to make an oral presentation (20%)

Prerequisites BIOL 367, CHEM 374 recommended